

### Remarks

Claims 1, 4, 5, and 7-13 are pending in the application.

Claims 1, 4, 5, 8 and 10-13 are rejected under 35 U.S.C. §103(a) as being allegedly obvious over US 5,498,355 to Perozzi et al. ("Perozzi") in view of EP 0434464 A1 to Walters et al. ("EP '464") and US 5,242,613 to Ozbalik ("Ozbalik"). Claims 7 and 9 are rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of Walters and Ozbalik, and further in view of US 6,133,207 to Milner et al. ("Milner"). Claim 8 is rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of Walters and Ozbalik and further in view of European Patent Publication No. EP 0744456 A2 to Walters et al. ("EP '456"). Claim 5 is rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of Walters and Ozbalik and further in view of US 4,282,153 to Minn ("Minn"). All rejections are respectfully traversed in light of the remarks presented herein.

### Response to Advisory Action

The Advisory Action specifically points to Example 10 of Ozbalik. The Examiner alleges that a disulfide present at 17.1 mg, a trisulfide present at 44.1 mg, and a tetrasulfide present at 31.1 mg gives a final CCT value of 147.032. However, the Examiner is mistaken in the interpretation of Example 10. In particular, Ozbalik is directed to a combination of 5-30 GC area % di-t-butyl disulfide, > 30 GC area % di-t-butyl trisulfide, **less than 15 GC area % higher dialkyl polysulfides**, and 2-40 GC area % hydrocarbyl thiophosphate or thiophosphine. In Example 10, 17.1 GC area % disulfide, 44.1 GC area % trisulfide, and **31.1 GC area % tetrasulfide are combined with a 1:1 mixture based on volume of DBHP and Primene 81R amine**. CCT values are provided in Table 7. However, the CCT measurements are taken after the reaction with the DBHP/Amine mixture. This reaction is intended to reduce the amount of higher polysulfides in the mixture. (And looking at our calculations in the attached response to final, for example, lower amounts of higher polysulfides would result in lower values of CCT). See col. 11, lines 58-61 and col. 7, lines 5-10 of Ozbalik. In the Table below we have expanded Table 7 from column 12 of Ozbalik. Based on the statements in the paragraph in column 11, lines 58-61 that the polysulfides are "treated with organophosphorus compounds to reduce the amount of higher polysulfides in the mixture" and similarly at column 7, lines 5-10, it is assumed that only the S4 polysulfides react with the mixture of DBHP and Primene 81-R. Further, Ozbalik teaches that "[t]he amount of organophosphorus compound charged to the reaction mass should be sufficient to convert at least a portion of the higher dialkyl polysulfides (i.e., sulfides containing more than three sulfur atoms per molecule) to dialkyl-lower polysulfides such that the recovered additive mixture contains **less than 15 GC area percent dialkyl-higher polysulfides**." (See Col. 7, lines 5-14).

Ozbalik Example 10 and Table 7: After reaction with DBHP and Primene 81-R					
DBHP/Amine (mL)	% S2	% S3	% S4	Ratio S3/S4	CCT
Reactants →	17.1	44.1	31.10	1.418 (extrapolated)	
1.0	17.1	44.1	33.16 (extrapolated)	1.33	239.7
3.0	17.1	44.1	28.45 (extrapolated)	1.55	165.3
7.0	17.1	44.1	17.09 (extrapolated)	2.58	54.1
10.0	17.1	44.1	7.36 (extrapolated)	5.99	40.2

So, when looking at this modified Table 7 it is clear that the only example that falls within Ozbalik's teachings is the last example since the amount of higher polysulfides is 7.36 % (i.e., less than 15%). All other examples are outside of Ozbalik's teachings of what constitutes a desirable polysulfide mixture. One of skill in the art would be led away from Nubar's first three examples (from Table 7) since each of these contains greater 15 GC area % higher polysulfide. Further, it is noteworthy that Ozbalik's only "good" example also has the lowest CCT value.

The presently claimed invention finds utility in what Ozbalik teaches is an undesirable combination. As you fall within Ozbalik's desired range, you decrease CCT. In the presently claimed invention, more S4 (or higher polysulfides) and a higher CCT is sought. This is counter-intuitive upon reading the Ozbalik reference.

The Advisory Action also responds to the argument that there is no motivation to combine Perozzi with EP '464. The Examiner states that it is sufficient that since Perozzi discloses the use of anti-wear agents and that EP '464 teaches an advantageous antiwear agent that reduces pollution that "motivation to combine" exists. But Perozzi is directed to a dispersant combination for use in engine oils, especially heavy duty crankcase oils. And EP '464 is directed to a zinc-free hydraulic fluid so that in an environment where spillage is possible, pollution is diverted.

Firstly, an engine oil and a hydraulic fluid are completely different fluids each having specialized additives to assist with the required function. An engine oil is designed and functions to lubricate the moving parts of an internal combustion engine as well as to, for example, clean, inhibit corrosion, improve sealing, and cool the engine. A hydraulic fluid transfers power in hydraulic machinery, such as brakes, power steering systems, or transmissions. So, even in their very basic function, these two fluids are different, and one designing one type of fluid would be unlikely to consult formulation techniques for the other type.

Also, Perozzi, the primary reference is not focused on an anti-wear agent and even lists such an agent as an optional component that may or may not even be included.

Lastly, even if these two were combined, the combination is still deficient in making the presently claimed invention obvious since none of the references disclose the particular combination including the specific polysulfide mixture having a CCT of greater than 125 mg.

**Perozzi in view of EP '464 and Ozbalik**

Claims 1, 4, 5, 8, and 10-13 are rejected under 35 U.S.C. §103(a) as being allegedly obvious over US 5,498,355 to Perozzi et al. ("Perozzi") in view of EP '464 and Ozbalik.

In the Office Action, independent claims 1 and 5 are rejected as allegedly obvious over Perozzi in view of EP '464 and Ozbalik. Claims 1 and 5 define gear oil compositions including, among other things, a di-t-butyl polysulfide mixture of di-t-butyl disulfide, di-t-butyl trisulfide, and di-t-butyl tetrasulfide, having a sulfur activity of greater than about 125mg in the Copper Corrosion Test. The gear oil compositions also include a dihydrocarbyl dithiophosphate ester, which claim 5 defines as the product of a mixture of dicyclopentadiene and dialkyldithiophosphoric acid. Further, the gear oil compositions also include a dihydrocarbyl (mono)thiophosphate amine salt.

Perozzi is directed to an engine oil dispersant composition of two different succinic derivative dispersants combined in a particular weight ratio to provide high dispersancy performance, especially when used in combination with metal-containing detergents. Generally, Perozzi makes reference to the fact that broad classes of extreme pressure ("EP") and anti-wear ("AW") agents may be used, only if desired, in conjunction with the mandatory dispersant composition. Included in the broad "laundry list" disclosure of such EP and AW agents are dihydrocarbyl polysulfides and amine salts of phosphoric acid esters and their partial or total analogues (Column 16, Line 18 – Column 17, Line 24), which as one of skill in the art would know encompasses an uncountable number of possible compounds, far from a finite and limited number of predictable options. Even though many possible alternative agents are listed, no teaching or suggestion is given as to the selection of any particular compounds for any reason, or to use the claimed mixture of components in the claimed proportions for achieving the objectives of the presently claimed invention. It is also notable that Perozzi makes no suggestion as to a particular mixture of agents that would be useful in achieving the objectives of the presently claimed invention.

Further, Perozzi makes no reference to the sulfur activity of the polysulfide component. Further, the present claims call for a mixture of di-t-butyl di-, tri-, and tetra-sulfides. The activity of such a mixture is dependent upon the relative proportions of the low and high activity components in the mixture. Perozzi is manifestly deficient in disclosing the claimed di-t-butyl polysulfide mixture, and fails even further in teaching that the mixture has a sulfur activity corresponding to the claimed Copper Corrosion Test ("CCT") value of greater than 125mg, which one of skill in the art would use as a guide for the mixing of the claimed components to achieve the desired results during the practice of the invention.

Polysulfides, nonetheless mixtures of di-tert-butyl trisulfide, di-tert-butyl tetrasulfide, and di-tert-butyl pentasulfide, exist which do not have a sulfur activity of greater than 125 mg in the copper corrosion test. Thus, the skilled person, starting from Perozzi, must still choose a polysulfide mixture which has a sulfur activity of greater than 125 mg in the CCT from among different possible mixtures which fall both above and below this sulfur activity level in order to arrive at the presently claimed invention. See discussion under number 7 of the previously submitted Declaration.

Perozzi does not mention the sulfur activity of its polysulfides nor does Perozzi provide any guidance to the skilled person to indicate that the sulfur activity is an important parameter. Further, Perozzi does not provide any incentive to select polysulfides having a sulfur activity of greater than 125 mg as measured by the CCT. Thus, from the teachings of Perozzi, taken alone, the skilled person would not have any reason to select polysulfides with a sulfur activity of greater than 125 mg as measured by the CCT in order to arrive at the subject matter of the present independent claims.

Moreover, the experimental data in the present application supports the conclusion that the specific subject matter of the independent claims solves the problem of providing a gear oil which passes all of the HT Axle Fatigue Test, the HT Bearing Test, and the L-42 Axle Shock Test. Examples C and E in Tables 1-2 on page 16 of the present application each represent a composition in accordance with the present invention and demonstrate that these compositions pass all three of these tests. See discussion under number 8 of the previously submitted Declaration.

Therefore, Perozzi fails to disclose or teach the combination as presently claimed and is absolutely silent as to the sulfur activity of a polysulfide component, which may or may not be included at all, and is likewise silent as to the inclusion of a dihydrocarbyl mono thiophosphate amine salt.

In an attempt to remedy the deficiencies of Perozzi to provide all of the elements and limitations of the present claims, EP '464 is combined with Perozzi. EP '464 is directed to a lubricant composition including an antiwear or load-carrying additive containing sulfur and/or phosphorus, and a corrosion inhibitor in the form of an amino succinated ester. The composition of EP '464 is said to be suitable for use in hydraulic fluids (page 2, lines 12-16).

As discussed above, there is a lack of motivation to combine Perozzi with EP '464. That said, even if one were to make such a combination, EP '464 does not remedy the deficiencies of Perozzi in making the presently claimed invention obvious. Firstly, neither reference specifies the required sulfur activity for an included polysulfide mixture. Secondly, neither reference specifies the particularly claimed polysulfide mixtures. Further, there is a lack of motivation to combine the two references. The Office Action is picking and choosing components that are listed in the cited references as alternative, optional embodiments in order to make the presently claimed combination. Accordingly, the present claims are not obvious over Perozzi in view of EP '464.

In an attempt to remedy the deficiencies of Perozzi and EP '464 to provide all of the elements and limitations of the present claims, Ozbalik is cited. See the discussion of Ozbalik above.

The presently claimed invention is thus considered to be nonobvious over the cited references since the cited references alone or in combination do not provide the skilled person with any indication of the importance of the sulfur activity of the composition. Nor do the cited references alone or in combination appreciate that use of a sulfur activity of 125 or greater would allow formulation of compositions which can pass all three of the HT axle fatigue test, HT bearing test, and L-42 axle shock test. The present comparative examples D and F clearly show that the sulfur activity is important to solving the problem of the presently claimed invention by isolating this parameter relative to Examples C and E of the presently claimed invention.

Therefore, the combination of Perozzi in view of EP '464 and Ozbalik is deficient in making the present independent claims obvious. The present independent claims, and likewise their dependent claims, are nonobvious over the cited combination.

**Perozzi in view of EP '464 and Ozbalik and further in view of Milner**

Claims 7 and 9 are rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of EP '464 and Ozbalik, and further in view of US 6,133,207 to Milner.

For the reasons given herein, the present claims are nonobvious over Perozzi in view of EP '464 and Ozbalik. Milner is further cited in combination with these references. Milner discloses a presulfurization process that reduces odor in certain phosphorus-containing additive compositions. Milner is silent as to the present combination of a polysulfide mixture having a sulfur activity of greater than 125 mg in the copper corrosion test, a dihydrocarbyl dithiophosphate ester, and a dihydrocarbyl (mono)thiophosphate ester. Therefore, Milner does not make up for the deficiencies of Perozzi in view of EP '464 and Ozbalik in making the present independent claims obvious. The present independent claims, and likewise their dependent claims, are nonobvious over the cited combination.

**Perozzi in view of EP '464 and Ozbalik and further in view of EP '456**

Claim 8 is rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of EP '464 and Ozbalik and further in view of EP '456.

For the reasons given herein, the present claims are nonobvious over Perozzi in view of EP '464 and Ozbalik. EP '456 is further cited in combination with these references. EP '456 is directed to a lubricant composition including an oil-soluble sulfur-containing antiwear and/or extreme pressure agent of low activity, described as 65mg or less on a copper corrosion test (page 4, lines 29-34). EP '456

especially prefers sulfurized olefins of low activity (page 4, lines 43-47). Accordingly, EP '456 does not teach, disclose, or suggest the presently claimed polysulfide having a CCT value of greater than 125mg. EP '456 is silent as to the present combination of a polysulfide mixture having a sulfur activity of greater than 125 mg in the copper corrosion test, a dihydrocarbyl dithiophosphate ester, and a dihydrocarbyl (mono)thiophosphate ester. As discussed herein, a polysulfide having the claimed sulfur activity is essential to the presently claimed invention. See the discussion on experimental data above and particularly the comparative data showing that a sulfur activity below 125 mg provides failing test results.

In the Office Action, the Examiner states that the sulfur activity required in EP '456 is irrelevant for the purposes of making the present claims obvious. The Applicants respectfully disagree. If one were to make a combination including the total of these 4 cited references, which they in fact would have no motivation to do, and each reference except EP '456 and Ozbalik are silent as to sulfur activity, one of skill in the art might consider the teachings of EP '456 and Ozbalik to this point since they are the only references that even mention this parameter. Further each of these references touts low sulfur activity as being desirable! Lastly, the fact that EP '456 discloses a thiophosphate amine salt does nothing to remedy the deficiencies in the previously made combination of Perozzi, EP '464, and Ozbalik, especially since the thiophosphate amine salt is taught to be a required component with a sulfur-containing component having a low sulfur activity. The total combination of these 4 references still does not make the present claims obvious.

EP '456 does not make up for the deficiencies of Perozzi in view of EP '464 and Ozbalik in making the present independent claims obvious. The present independent claims, and likewise their dependent claims, are nonobvious over the cited combination.

#### **Perozzi in view of EP '464 and Ozbalik and further in view of Minn**

Claim 5 is rejected under 35 U.S.C. §103(a) as being allegedly obvious over Perozzi in view of EP '464 and Ozbalik and further in view of Minn.

For the reasons given herein, the present claims are nonobvious over Perozzi in view of EP '464 and Ozbalik. Minn is further cited in combination with these references. The total combination of these 4 cited references still does not make the present claims obvious. Minn is directed to an insecticidal composition. Minn fails to make any teaching, disclosure, or suggestion as to the claimed components in the claimed proportions. Just as with the other three references discussed above, Minn is also manifestly deficient in teaching, disclosing, or suggesting the claimed polysulfide having the claimed CCT value of above 125mg. Further, there is a lack of motivation apparent from any of the 4 cited references to make the presently claimed combination.

Minn does not make up for the deficiencies of Perozzi in view of EP '464 and Ozbalik in making the present independent claims obvious. The present independent claims, and likewise their dependent claims, are nonobvious over the cited combination.

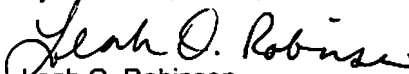
Reconsideration and allowance of claims 1, 4, 5, and 7-13 is hereby respectfully requested.

**Conclusion**

Applicants respectfully submit that a full and complete response to the office action is provided herein, and that the application is now fully in condition for allowance. Action in accordance therewith is respectfully requested.

Please charge Deposit Account No. 12-2355 in the amount of \$940.00 (fees for one month extension of time of \$130 + RCE of \$810). The undersigned believes that there are no additional fees, other than the fees stated above, associated with this filing. However, if the calculations are incorrect, the Commissioner is hereby authorized to charge any deficiencies in fees or credit any overpayment associated with this communication to Deposit Account No. 12-2355. Please grant any extensions of time required to enter this response and charge any additional required fees to Deposit Account No. 12-2355.

Respectfully submitted,  
By: LUEDEKA, NEELY, AND GRAHAM, P.C.

  
Leah O. Robinson  
Reg. No. 44,990

Date: 03/03/10  
P.O. Box 1871  
Knoxville, TN 37901  
865.546.4305 (tel)  
865.523.4478 (fax)  
lrobinson@LNG-patent.com